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"An apparatus for the capture and removal of foreign objects from the body interior"

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An apparatus for the capture and removal of foreign objects from the body interior

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CLAIMS

Claimed is:

1. An apparatus for the capture and removal of foreign objects from the body interior, essentially comprised of a loop retractable into a tube and an activation device, whereby the loop, under the effect of its own elasticity opens in its extended state, therein characterized, in that the loop (10) is composed of ribbon shaped material, the inner side of which is provided with a slip resistant surface.

2. An apparatus in accord with Claim 1, therein characterized, in that the loop (10) in its extended state exhibits a shape which is essentially an oval.

3. An apparatus in accord with Claim 1, therein characterized, in that the loop (10) in its extended state exhibits a shape which is essentially the segment of a circle.

4. An apparatus in accord with Claim 3, therein characterized, in that the secant is designed to be more rigid than the circular arc (23) and one end of the circular arc (23) is longitudinally slidable in relation to the secant.

5. An apparatus in accord with one of the Claims 1 to 4, therein characterized, in that the inner surface of the loop (10) is inset with small projections (21).

6. An apparatus in accord with one of the Claims 1 to 5, therein characterized, in that the activation device is comprised of a holder (18) and a first hand grip (15) slidable in the longitudinal direction of said holder 18.

7. An apparatus in accord with one of the Claims 1 to 6, therein characterized, in that the activation device exhibits a second hand grip (16).

8. An apparatus in accord with Claim 7, therein characterized, in that the second hand grip (16) is provided with an eyelet (17).

9. An apparatus in accord with Claim 7 or 8, therein characterized, in that the second hand grip (16) and a spacer collar (19) appurtenant to said second hand grip (16) are bound to one another by a threaded engagement (25) and the unused length (26) of the spacer collar (19) is adjustable by relative turning.

10. An apparatus in accord with one of the Claims 1 to 9, therein characterized, in that the free end of the loop (10) is provided with a rounded off covering cap (20).

11. An apparatus in accord with Claim 10, therein characterized, in that the covering cap (20) has approximately the form of a hemisphere, the circular cross section of which corresponds to the cross-section of the tube (11).

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DESCRIPTION

[German Page No. 3]

The invention concerns an apparatus for the capture and removal of foreign objects in accord with the generic concept of Claim 1.

Made common knowledge by the German patent DE 2 132 809, is an apparatus for the removal of excrescent growths, preferably in the intestinal tract. That apparatus concerns a wire loop onto which is fastened the end — which end is to confront the growth — of a loop moving means in a longitudinal slide guide within said boring. The said loop possesses a springlike characteristic, so that, upon emerging from the longitudinal, axially slide guide, the said loop takes on the shape of an oval. In this form, the loop captures the growth to be removed and can excise it.

DE 10 24 202 and DE 10 32 474 also made known such apparatuses. These apparatuses exhibit, respectively, an instrument channel, in which a longitudinal slidable guideway, here designed as an instrument holder having on its forward end a cutting loop which is guided axially. The cutting loop, which is comprised of wire, is laid over the growth to be excised. After connection to a voltage source, the loop is pulled tight enough to obtain a certain degree of tension. At this moment, as a result of simultaneous axial movement of the instrument holder in the manner of an electrical knife, the growth, is excised without loss of blood. This rigidly designed equipment, the shaft whereof possesses a relatively large diameter, allows observations and operations only to at certain depth. In the case of the last mentioned equipment, the loop can never be fully pulled up

[German Page No.4]

to its extreme extent, because of wire breakage or underlying causes of deformation of tissue. On this account, a defined minimum opening of the loop open area must be maintained and the final resection of the growth is carried out by the axial movement of the instrument holder.

These said apparatuses are not suitable for the certain capture, holding and removal of foreign bodies, since the said foreign bodies slip very easily out of the loop.

The purpose of the present invention lies in creating an apparatus for the capture and removal of foreign objects from the interior of a body, in which apparatus the foreign object is more securely seized and held by the loop. The achievement of this purpose is accomplished, in accord with the invention, by the features of Claim 1. Advantageous developments in this regard become evident from the subordinate claims.

The invention, in the following, will be described by the use of the reference numbers of the drawing. In the loop which is depicted in the figure, the concern is with:

- **A formation of two circular segment areas attached to one another by their common secant.**

The loop, however, deviating from the presentation in the figure, can also assume the form

[German Page No. 5]

of essentially a single circular segment.

For clarification, the drawing also shows a side view of the loop.

The loop 10, is comprised of flat, ribbon shaped material and can be retracted into a tube. This retraction is activated by a pull-wire.

Through the tube 11, the pull-wire 12 is fastened to an activation device, whereby the said pull-wire 12 is connected to a first hand grip 15 and its accompanying holder 17. First hand grip 15 and Second hand grip 16 are longitudinally slidable in reference to a hollow cylinder 18, and in this manner retract the loop into the tube.

In order to achieve a sensitive action and at the same time, a sure and certain closure of the loop 10, the relative movement between the second hand grip 16 and the first hand grip 15 extends over a spacer collar 19, which is in a threaded engagement 25 with the second hand grip 16. By the turning of the hand grip 16 in relation to spacer collar 19, the length of the unused length 26 of the spacer collar 19 can be changed. With this change the relative positions of the second hand grip 16 to the first hand grip 15 can be altered.

The free end of the loop 10 is advantageously provided with a rounded off covering cap 20, for the purpose of preventing damage to any bodily parts upon the emergence of the loop 10 from its tube 11.

This covering cap 20 can have the shape of a hemisphere, the circular area of which corresponds to the cross-sectional area of the tube 11, so that in the emerging condition

[German Page No. 6]

of the loop, a continuous transitional movement from the tube 11 is provided for said covering cap 20.

By means of the flat, ribbon shape of the loop, the seizing surface with which the foreign object can be grasped is increased.

In inner side of the loop is provided with a non-slipping surface. This can be done by an appropriate coating or by small projections 21. By this means, a slipping away of the foreign object from the loop is prevented. In case of need, a non-slipping surface, that is, an appropriate coating of the ribbon shaped material of the loop, as well as the projections 21 can be provided. The projections 21 can also be comprised themselves of a non-slip material.

In the case of a loop with a circular segment shape, it is of advantage, to make the secants more rugged than the circular bow 23, so that upon a tightening of the pull-wire 12, only the circular bow is formed, while the secant remains in its original shape. In such a case, then the circular arc 23 is only made fast to the secant at one end, while the other end of the circular arc 23, is slidable in a longitudinal direction relative to the said secant. Upon drawing on the pull-wire 12, the circular arc 23 continuously flattens itself, and approaches the secant as a limit, until the foreign object is held tight between the secant and the circular arc 23. The loop 10 can be retracted into the tube only so far as the foreign object permits.

[German Page No. 7]

The relative movement of the pull-wire 12 is effected by a movement of the second hand grip 16 relative to the hollow cylinder 18. In order to make this procedure more sensitive and certain in its operation, a spacer collar 19 is installed, which is in threaded engagement with the second hand grip 16. Through a relative turning between the spacer collar 19 and the second hand grip 16, the unused length of the spacer collar 26, along with the length of the pull wire extending from the tube 11, can be changed.

The tube 11 can be provided with a Luer-connection 24, in order to clean and disinfect the tube 11.

The function of the above described apparatus is as follows:

In the withdrawn condition of the loop 10, its carrying tube 11 is inserted to the current body part of concern. This can be done by means of an instrument channel of an endoscope and if required under monitoring of X-ray observation. As soon as the desired position has been attained, the loop 10 extends and, again, under monitoring of X-ray observation or by means of the endoscope, the capture of the foreign object in the loop is observed. If the foreign object is caught in the loop, then by means of the second hand grip 16 — if necessary with the aid of the spacer collar 19 — the pull-wire is drawn in and thereby the cross-section of the loop 10 is narrowed until the foreign object is securely captured. At this point, the loop 10 is retracted only so far into the tube 11 as is permitted by the foreign object. Subsequently, the removal of the foreign object out of the body interior is done in the conventional manner.

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